

DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Means for Regulating the Tension in Webs, Bands, Sheets, Tracks
or the like.

We, ALLMANNA SVENSKA ELEKTRISKA AKTIEBOLAGET, a Swedish Company, of Vasteras, Sweden, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to means for regulating the tension in a web, band or sheet of paper or the like material having low elasticity and low strength, hereinafter simply referred to as a web. The tensioning means is of the kind in which a web, in its passage between spaced-apart support members, is made to bear against a movable tensioning member (e.g. a roller mounted on a pivoted arm).

Tensioning means of this kind are already known in which the tension applied by the tensioning members to the paper web is obtained from one or more mechanical springs or from weights, but these solutions of the problem of obtaining and normally holding the paper tension constant, for example close to a roll stand of a printing press, have been found to have disadvantages. The normally steep spring characteristic for, for example, a mechanical spring causes great variation in the paper tension, which is a disadvantage. Another reason for its defectiveness is hysteresis in the mechanical spring. A tensioning means comprising weights has, *inter alia*, the disadvantage that variations in the paper tension are obtained because of the *vis inertiae* of the weights.

The present invention relates to a tensioning means of the kind referred to, in which the mentioned drawbacks are eliminated. The device is characterised in that the movable member is loaded with at least one pneumatic servo-device, operating in a direction for tensioning the web, the pressure

space in the servo-device or in each of said servo-devices being connected to one or more reservoirs of pneumatic pressure medium, the volume of said reservoir or the sum of the volumes of said reservoirs being much larger than the volume of the pressure space of said servo-device or the sum of the pressure spaces of all the devices, said movable member being connected to a measuring device whose output signal is arranged to control the speed of the rolling or unrolling of the web, the force exerted by the servo-device being adjustable to certain constant or variable values which values are maintained independently of displacements of the movable member. The characteristic of the tensioning means can be given the desired form by a suitable relation between the volume of the pressure space of the servo-device or servo-devices and the volume of the pressure medium reservoir or reservoirs. The use of pneumatic pressure medium enables very fast adjustments in load to be obtained in contrast to a system employing hydraulic pressure medium where the high inertia of the medium slows the response of the system. By employing a high volume in the reservoirs of pneumatic pressure medium in relation to a low volume in the pressure spaces of the servo-devices, it is possible to obtain a very level characteristic in the curve of load against displacement. The displacement of the movable member thereby occurs in response to a very low (and in practice, almost zero) change in load upon the web and consequently there is very little risk of breakage of the web.

Adjustment between different desired web tensions can very easily be effected with the means according to the invention. The most usual use for the invention is that the servo-device is set at a constant web tension.

One embodiment of a tensioning means

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in accordance with the invention for use with a printing machine will now be described by way of example, with reference to the accompanying drawing, in which

5 Figure 1 is a schematic side view of the tensioning means, and

Figure 2 is a diagram illustrating the principle of operation of the means of Figure 1.

In Figure 1 an embodiment of the invention is shown in which two pivoted arms 11 support a tensioning member in the form of a roller 12 which may be rotatable or non-rotatable in relation to said arms. Although in this particular embodiment there are two arms 11, one arm, or more than two such arms, may be used. A web 13 of paper being rolled or unrolled is carried over one support member in the form of a jockey pulley 14, round the tensioning roller 12 and then over a second spaced-apart jockey pulley 15. The roller 12 and the pulleys 14, 15 are normally in the vicinity of a roll stand of a printing press and arranged near the conventional glueing device, photocell device, etc., of the press with the object of facilitating the servicing of the different devices. Each arm 11 is pivotally mounted near one end 30, and is engaged at some suitable place between this end 30 and the tensioning roller 12 by a pneumatic servo-motor 16, 17. The servo-motors 16 and 17 may be replaced either by a single servo-motor (not shown) which engages the arms 11, the tensioning roller 12 or a yoke joined to the arms 11 via suitable link means or by three or more servo-motors. In the embodiment shown, the servo-motors 16, 17 comprise a cylinder 18, 19 (see Figure 2) with a piston 31, 32, respectively. The cylinders 18, 19 communicate via a conduit 20 with a common pressure-medium reservoir 21 containing a gaseous pressure medium. A flexible member 27 joined to one or both of the arms 11 passes round a pulley 28 and transmits the movements of the arms 11 to a measuring device including a potentiometer and a tachometer-generator and schematically indicated at 29. The output signals from this measuring device are supplied to the control circuit for a motor (not shown) for controlling the speed of rolling or unrolling of the paper web. Outlet and inlet conduits 22, 23 provided with valves 24, 25 lead to the pressure medium reservoir 21 (Figure 2) and a pressure gauge 26 is also connected to the reservoir. By suitable adjustment of the valve means 24 and 25, the desired pressure in the reservoir and thus the desired constant or variable pressure in the cylinders 18, 19 can be set. As has already been mentioned, the characteristic of the system is dependent upon the volume relation between, on the one hand, the reservoir volume and, on the other hand, the pressure volume in the cylinders 18 and 19. The dimensioning of the supply conduits to

the cylinders is also important for optimum functioning of the device. By suitably forming the pressure medium system it is possible either, (and most usually) to obtain a desired constant paper tension, or to provide for successive alterations of the desired paper tension if it should be necessary for a certain purpose.

The above described tensioning means operates in the following way:

By means of the valves 24 and 25 a desired constant paper web tension is set on the pressure gauge 26 (suitably graduated empirically), which tension is obtained through the forces exerted by means of the pressure medium supplied to the servo-motors 16 and 17. This results in the setting of the arms 11 and hence the roller 12 in a certain position (their zero position) and a certain paper tension is obtained. If the actual web tension now decreases in relation to the set value (obtained from 16 and 17), the arms 11 and the roller 12 are displaced to the right in Figure 1. A movement is thus indicated in the potentiometer and a speed of movement in the tachometer-generator of the measuring device 29. The output signals of this device are combined in a suitable manner to form a resultant signal which in turn is transmitted to a control member of the rolling or unrolling motor, which in this case increases its braking influence on the paper web and the actual web tension increases and the arms 11 return to their zero position as a result of the balance between the actual and desired web tension. The circumstances will of course be the opposite with increased web tension.

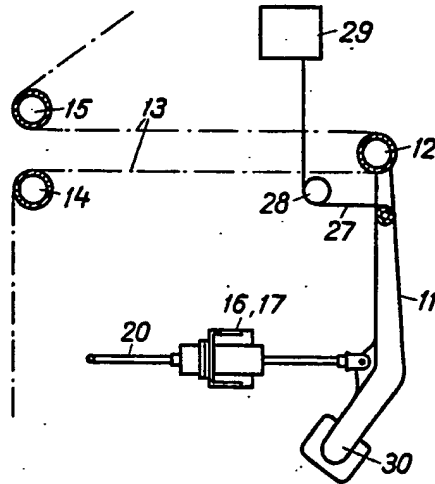
Although the invention has been described in detail above with reference to a printing machine, it will be appreciated that the tensioning means according to the invention may be employed in other web handling apparatus, for example rewinding machines and rolling machines.

WHAT WE CLAIM IS:—

1. Means for regulating the tension in a web as hereinbefore defined, comprising spaced-apart support members for the web and a movable tensioning member against which the web bears in its passage between the support members characterised in that the movable member is loaded with at least one pneumatic servo-device, operating in a direction for tensioning the web, the pressure space in the servo-device or in each of said servo-devices being connected to one or more reservoirs of pneumatic pressure medium, the volume of said reservoir or the sum of the volumes of said reservoirs being much larger than the volume of the pressure space of said servo-device or the sum of the pressure spaces of all the devices, said movable member being connected to a measuring

- device whose output signal is arranged to control the speed of the rolling or unrolling of the web, the force exerted by the servo-device being adjustable to certain constant or variable values which values are maintained independently of displacements of the movable member.
2. Means according to claim 1, in which the movable member is connected to a potentiometer and a tachometer-generator, the output signals of which are arranged to influence an electric rolling or unrolling motor.
3. Means according to claim 1 or 2, in which there are at least two servo-motors each influencing a pivoted arm or other part of a pivoted tension roller serving as the movable member, each servo-motor being provided with a pressure space which is in communication with one common reservoir or several reservoirs for the pressure medium, to and from which lead pressure medium conduits provided with valves.
4. Means according to claim 3, in which said servo-motor comprises a piston movable in a cylinder, against which piston the pneumatic pressure medium is arranged to operate.
5. Means for regulating the tension in a web constructed and arranged substantially as herein described with reference to the accompanying drawing.
6. A web handling machine comprising the tension regulating means claimed in any one of claims 1 to 5.
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Fig. 1**Fig. 2**